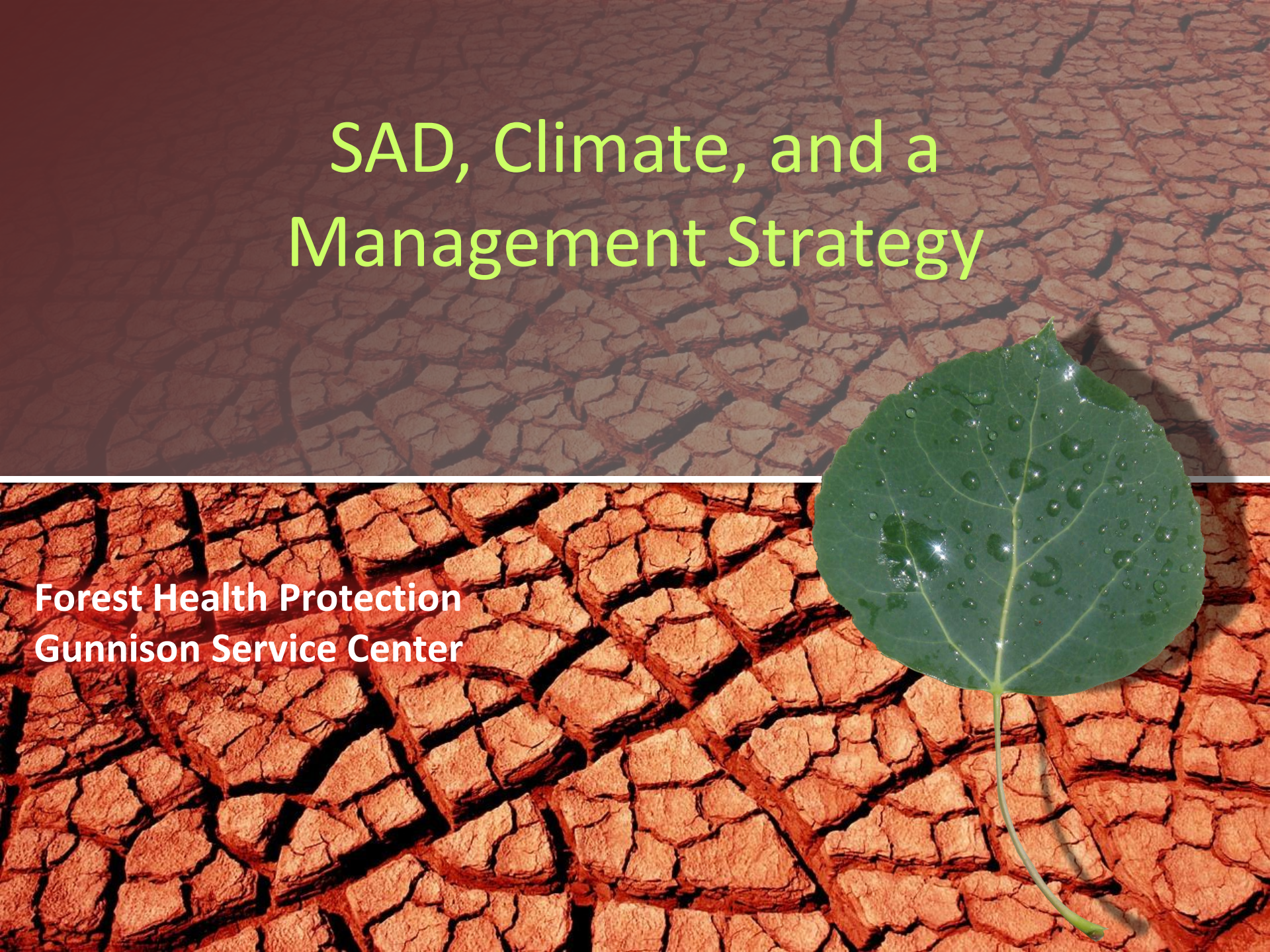
SAD, Climate, and a Management Strategy



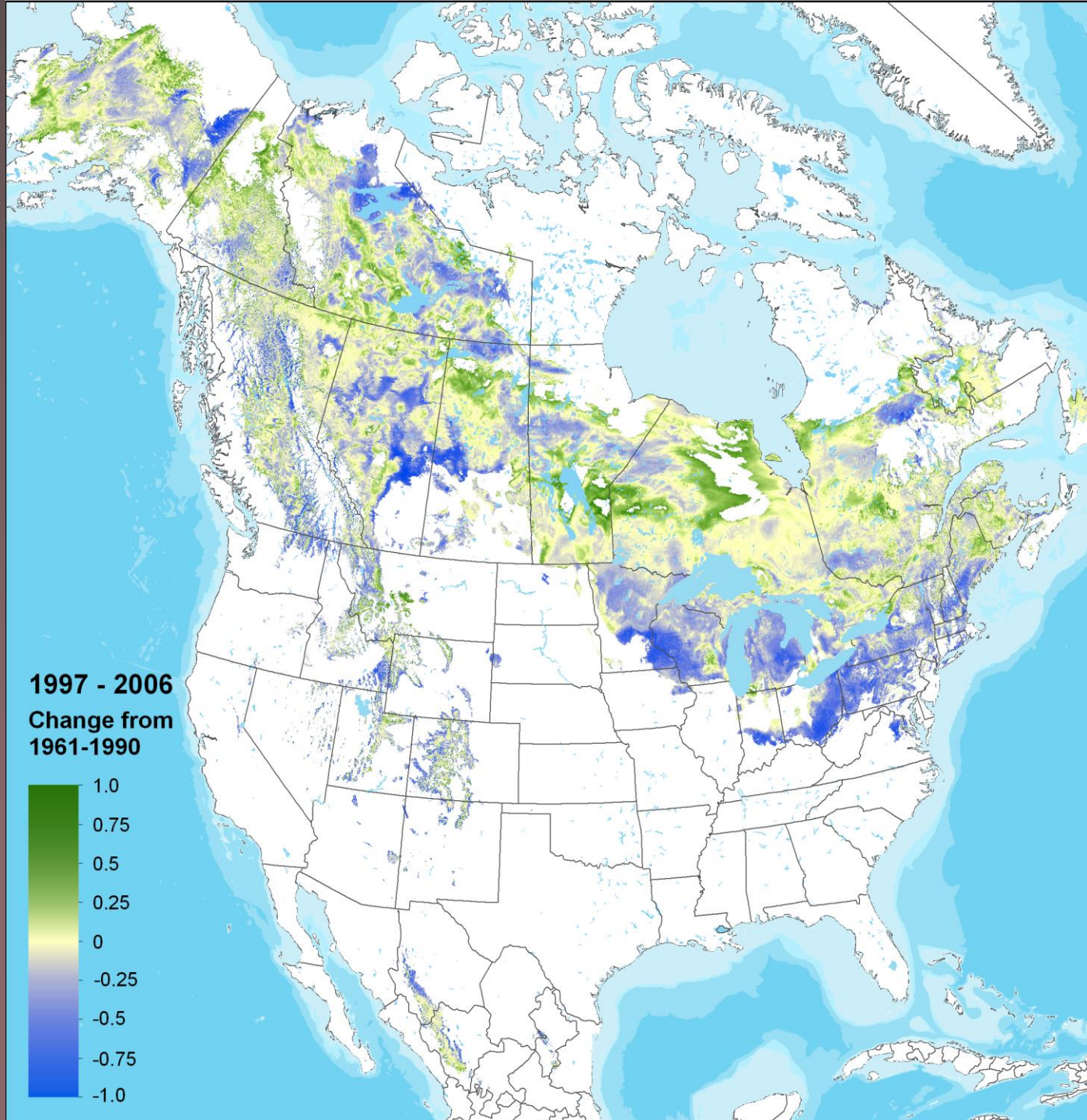
Forest Health Protection
Gunnison Service Center

Outline

1. Recent declines and climate in North America / southern Rockies
2. Current trends in SAD stands
3. Future of aspen under changing climate
4. Management proposal

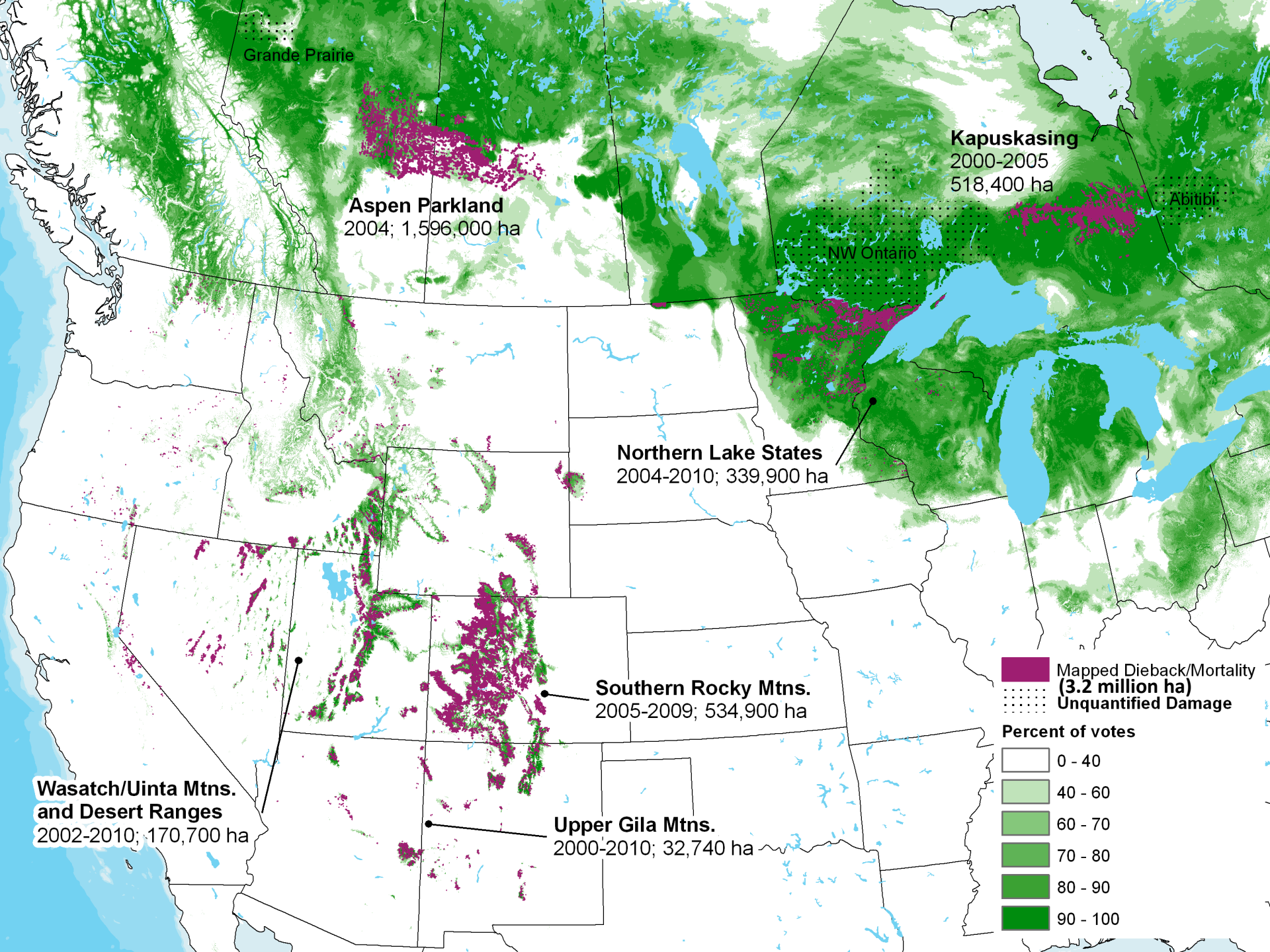
Recent change in suitability

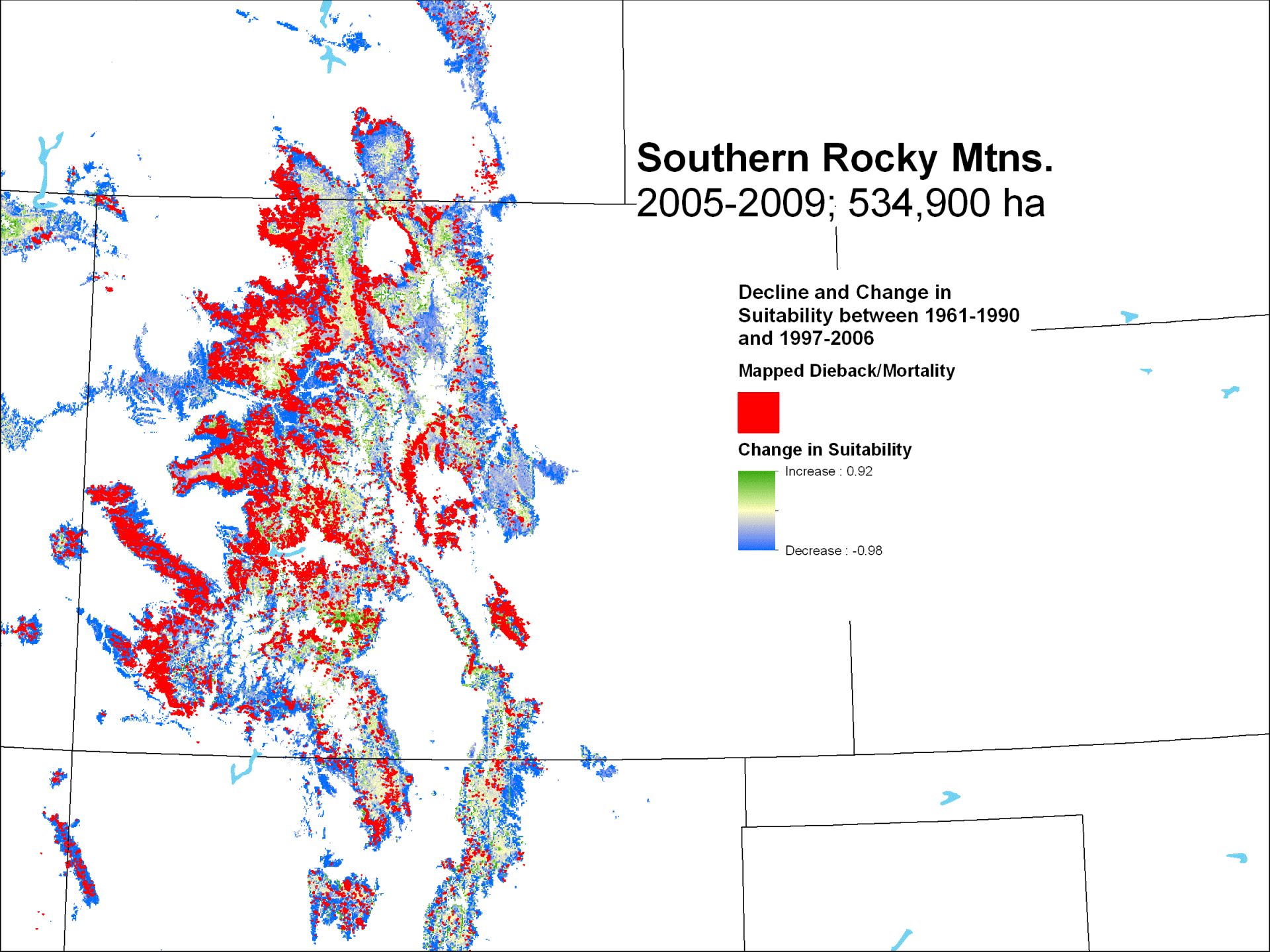
- Rangewide bioclimate model indicates climate suitability for aspen
- Here, suitability of the reference period (1961-1990) subtracted from that of 1997-2006
- Green is increase, blue decrease.

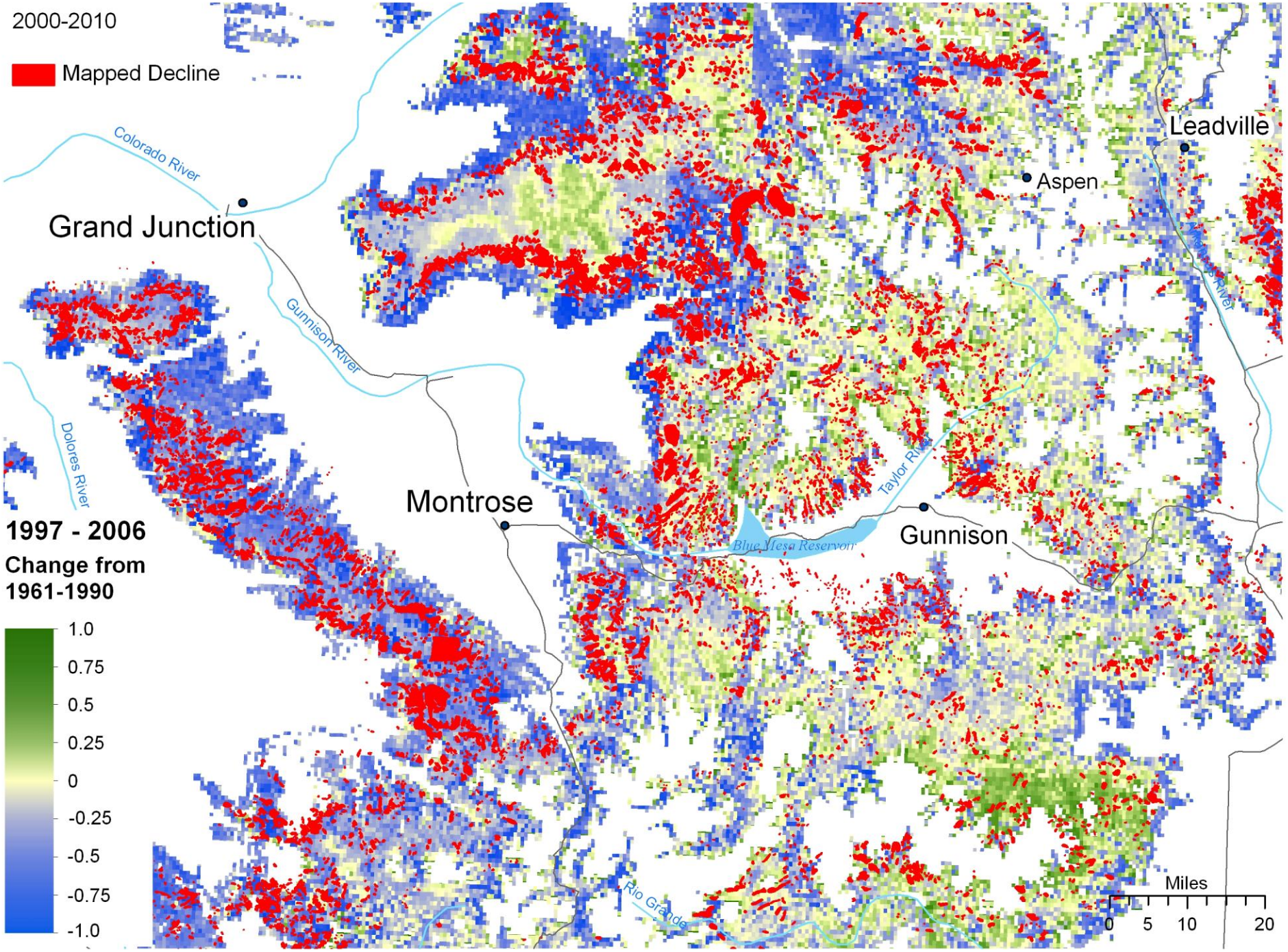


Declines 2000-2010

- Extensive, moderate to severe branch dieback/mortality/decline
- 3.2 million ha (footprint) in six regions of North America


Grande Prairie
Aspen Parkland
2004; 1,596,000 ha
Kapuskasing
2000-2005
518,400 ha
Abitibi
NW Ontario
Northern Lake States
2004-2010; 339,900 ha
Southern Rocky Mtns.
2005-2009; 534,900 ha
Wasatch/Uinta Mtns.
and Desert Ranges
2002-2010; 170,700 ha
Upper Gila Mtns.
2000-2010; 32,740 ha
Mapped Dieback/Mortality
(3.2 million ha)
Unquantified Damage
Percent of votes
0 - 40
40 - 60
60 - 70
70 - 80
80 - 90
90 - 100

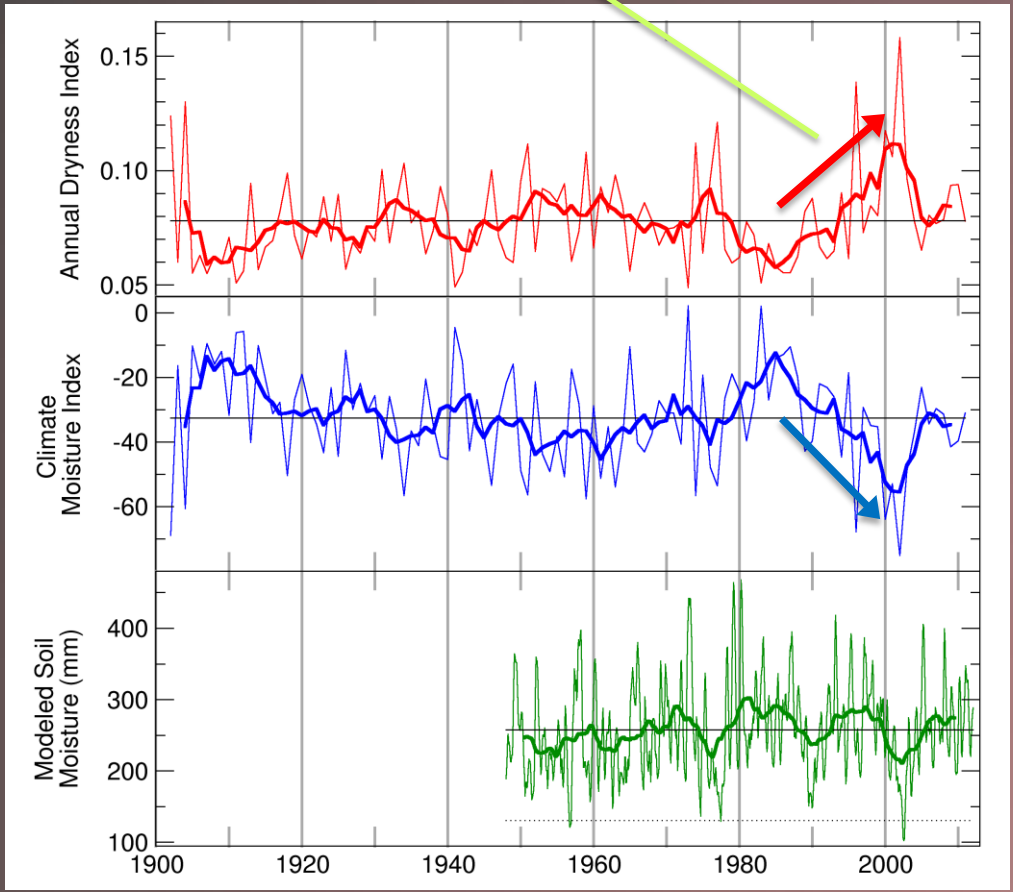

Southern Rocky Mtns.
2005-2009; 534,900 ha
Decline and Change in Suitability between 1961-1990 and 1997-2006
Mapped Dieback/Mortality
Change in Suitability
Increase : 0.92
Decrease : -0.98


2000-2010
Mapped Decline
Colorado River
Grand Junction
Gunnison River
Dolores River
Montrose
Aspen
Leadville
Taylor River
Blue Mesa Reservoir
Gunnison
Rio Grande
1997 - 2006
Change from
1961-1990
1.0
0.75
0.5
0.25
0
-0.25
-0.5
-0.75
-1.0
Miles
0
5
10
20

Southern Rockies

Drying trend since mid '80s

Record drought 2001-2003



Models and other evidence strongly indicate dominant causal role of climate.

Southwestern Colorado

CURRENT TRENDS

Current Trends in SW Colorado

- Since 2009, no large new areas affected by SAD
- Areas previously affected continue to be impacted
  - Sick and healthy plots originally measured 2007/08, GMUG and western SJNF
  - Remeasured 2013

Current Trends in SW Colorado

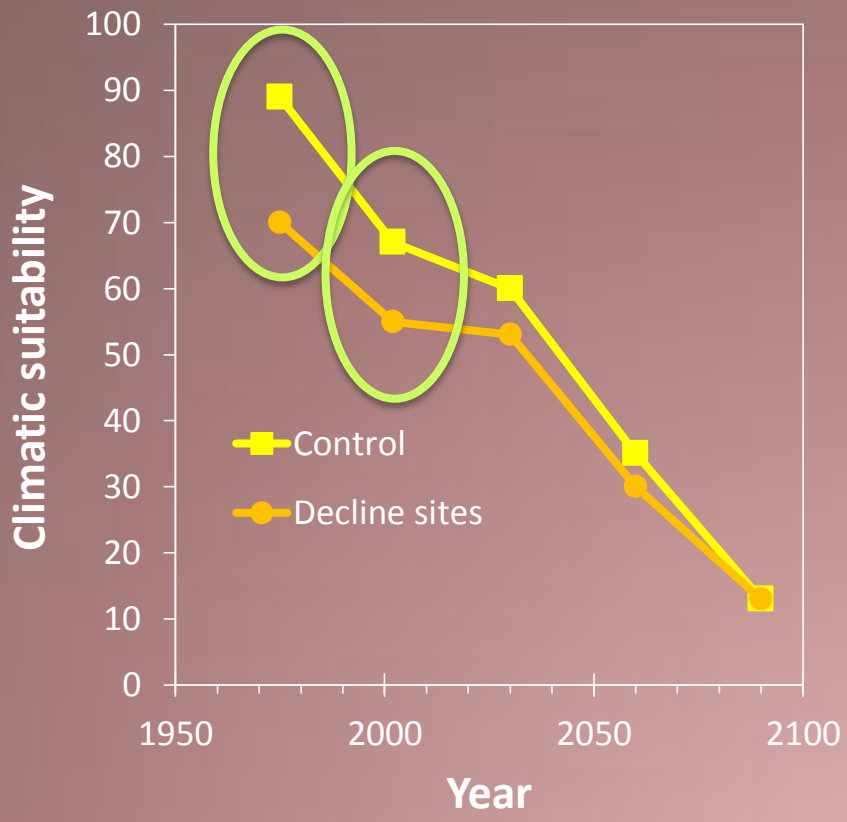
- Sick plots
  - Continue to decrease in live density, basal area
    - Now less than half that of healthy plots
  - Recent crown loss still 4x healthy plots
  - Over 2x recent dead and snag density
  - Significant decrease in suckering (healthy plots increased)

Conclusion:
Sick plots continue to unravel, deteriorate

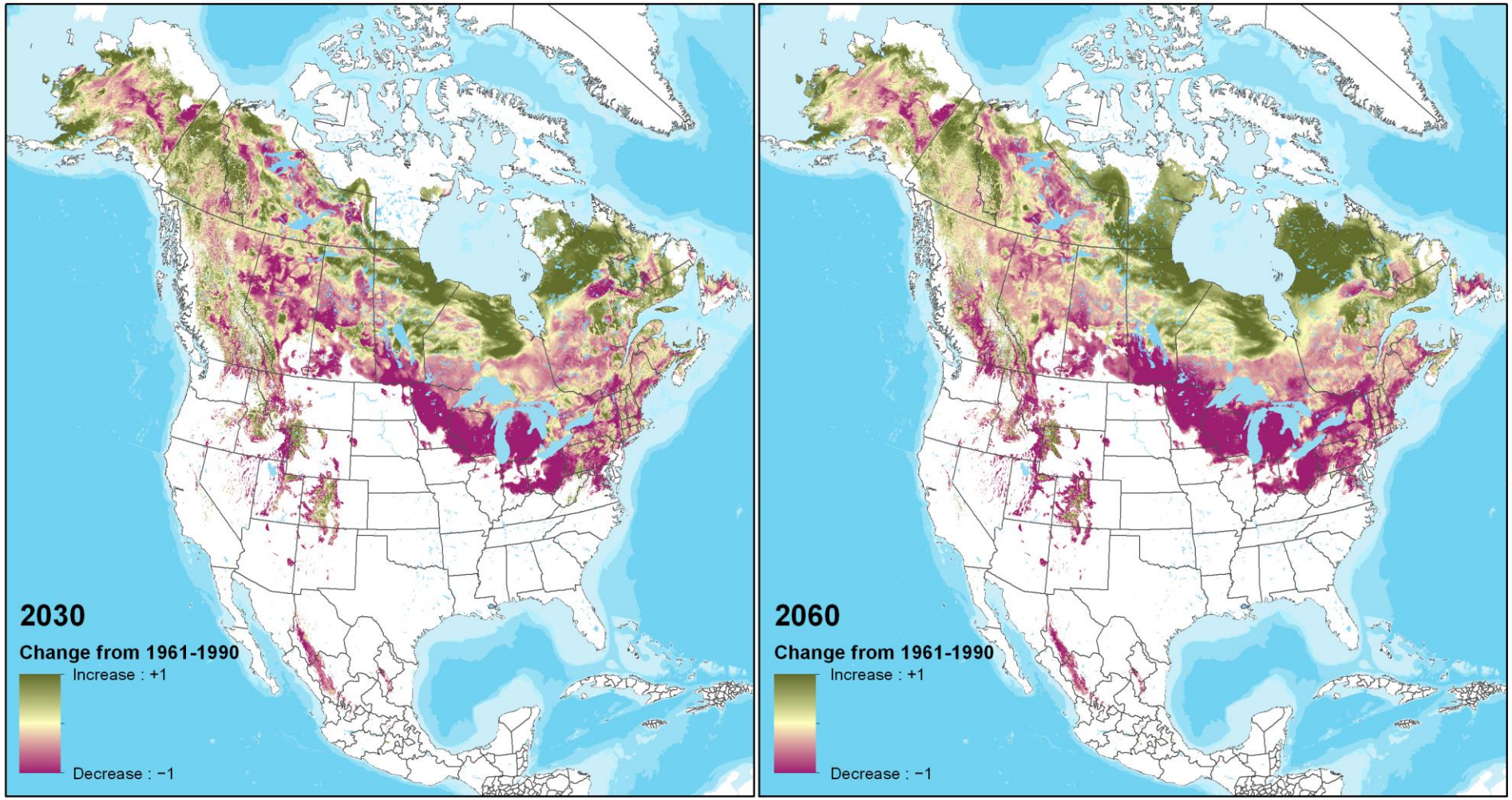
FUTURE UNDER CLIMATE CHANGE

Climate suitability of decline areas vs. all aspen – Southern Rockies

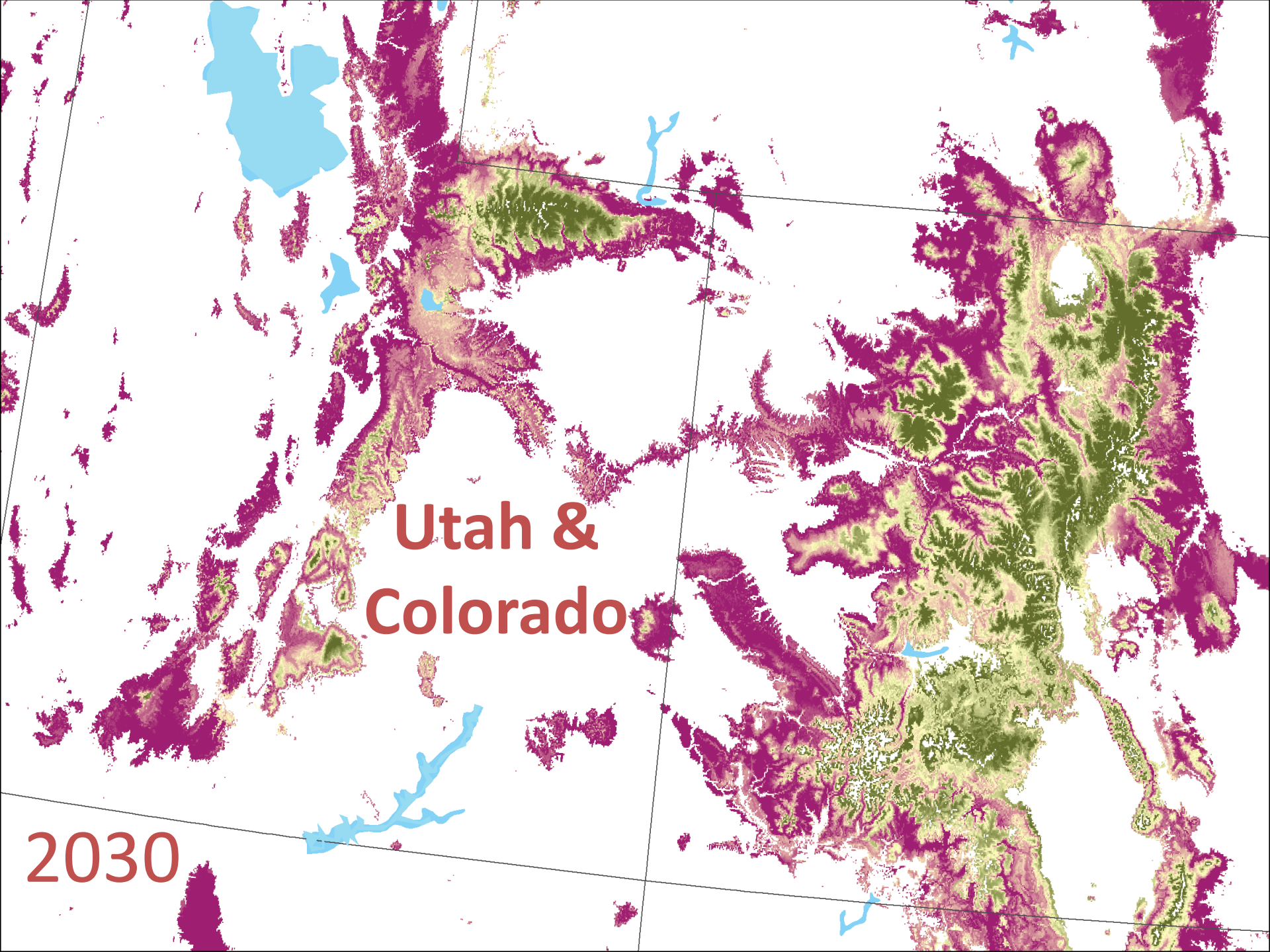
- Reference period: Decline sites have more marginal climates than aspen in general
- 1997-2006: On the trendline to future projections (slightly worse than expected)
- Decreasing suitability projected through the century

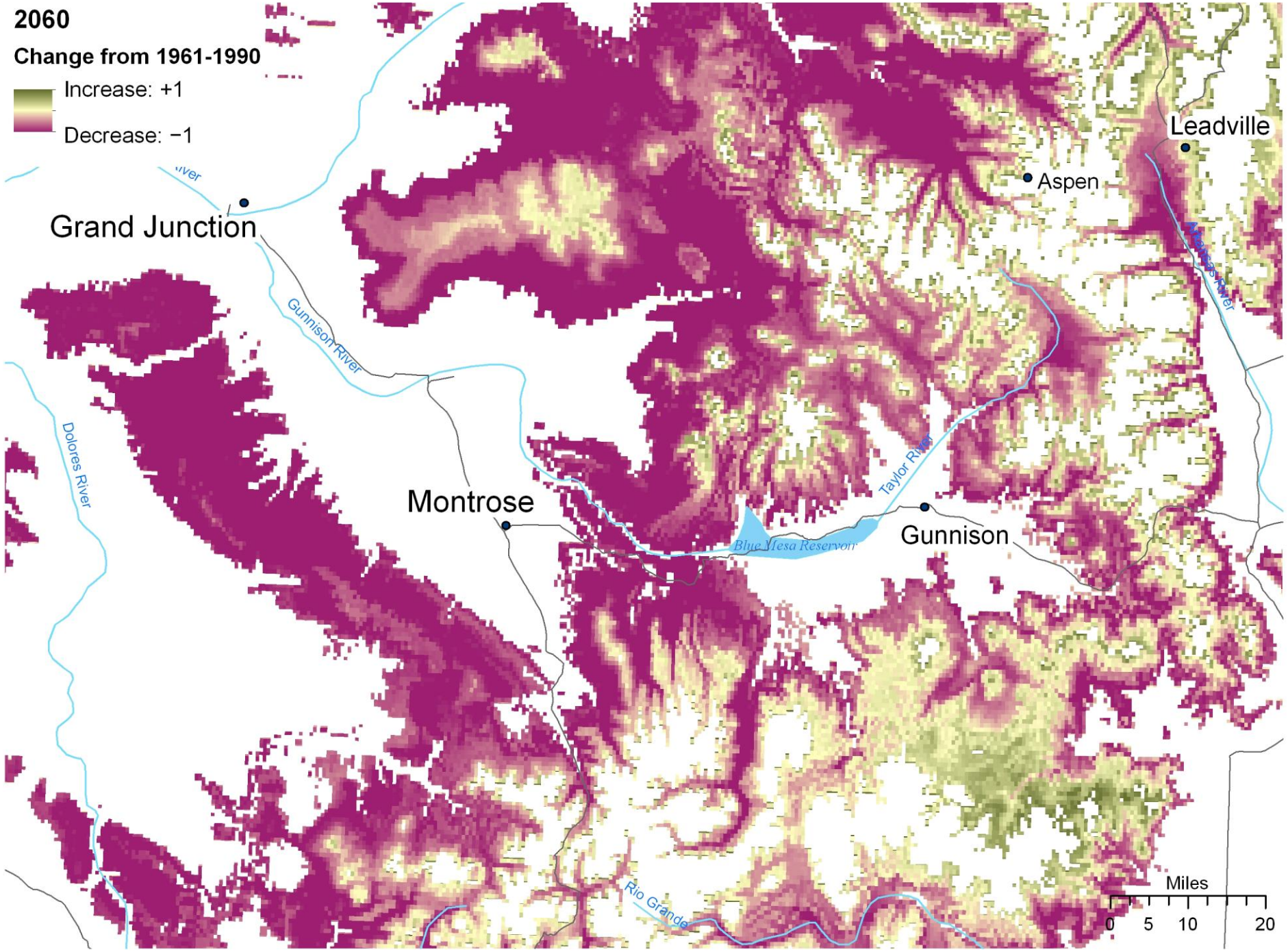


2030 and 2060



Differences between 1961-1990 and future suitability


Utah &
Colorado
2030


2060
Change from 1961-1990
Increase: +1
Decrease: −1
Grand Junction
Gunnison River
Montrose
Dolores River
Aspen
Leadville
Taylor River
Blue Mesa Reservoir
Gunnison
Rio Grande
Miles
0 5 10 20

Resilience, Recovery, Migration

MANAGEMENT STRATEGY

How to manage aspen?

- Tools
  - Regenerate mechanically or with fire
- Goals and Tactics
  - Resilience: regenerate mature aspen to increase resilience to future extreme drought events
  - Recovery: Regenerate SAD-affected stands before canopy loss is >50% to avoid losing them
  - Migration: Treatments to increase seed production and establishment

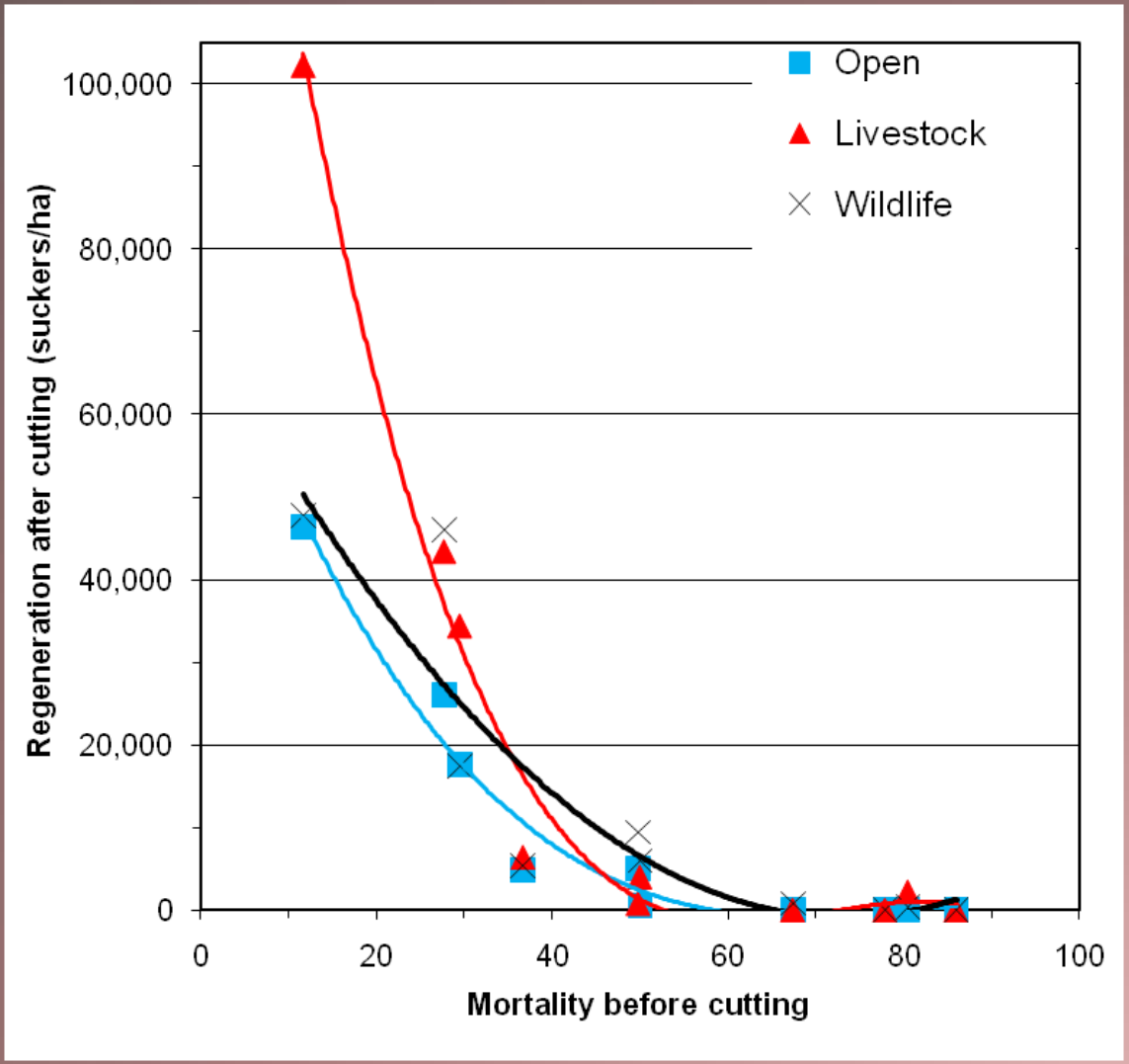
The Resilience of Youth

- 10-acre patch cut 1984
- Healthy regeneration surrounded by dead and dying untreated aspen
- Age <40 unaffected

∴ Age diversity enhanced resilience to SAD

Can SAD stands regenerate? - Utah

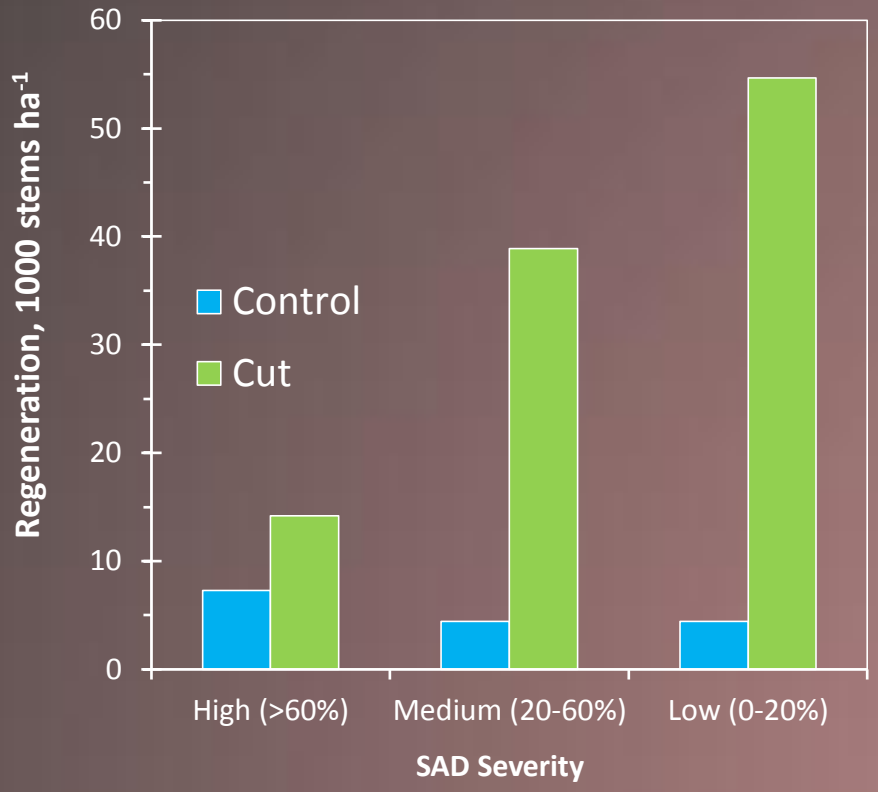
- Coppice harvest at different proportions of mortality
- Good response below ~50% mortality.



Ohms thesis 2003: SW UT, 2700 m elevation

Can SAD stands regenerate?

Terror Creek Applied Silvicultural Assessment



Wayne Shepperd & Skip Smith

Where to manage aspen?

- Using bioclimate model, classify aspen habitat:

1. LOST – future climate will be so unfavorable that aspen is unlikely to survive the century. Do not treat (except for short-term benefits).

2. THREATENED – future climate will be unfavorable, but young stands will probably survive. Treat to distribute young patches on landscape and to help SAD stands recover.

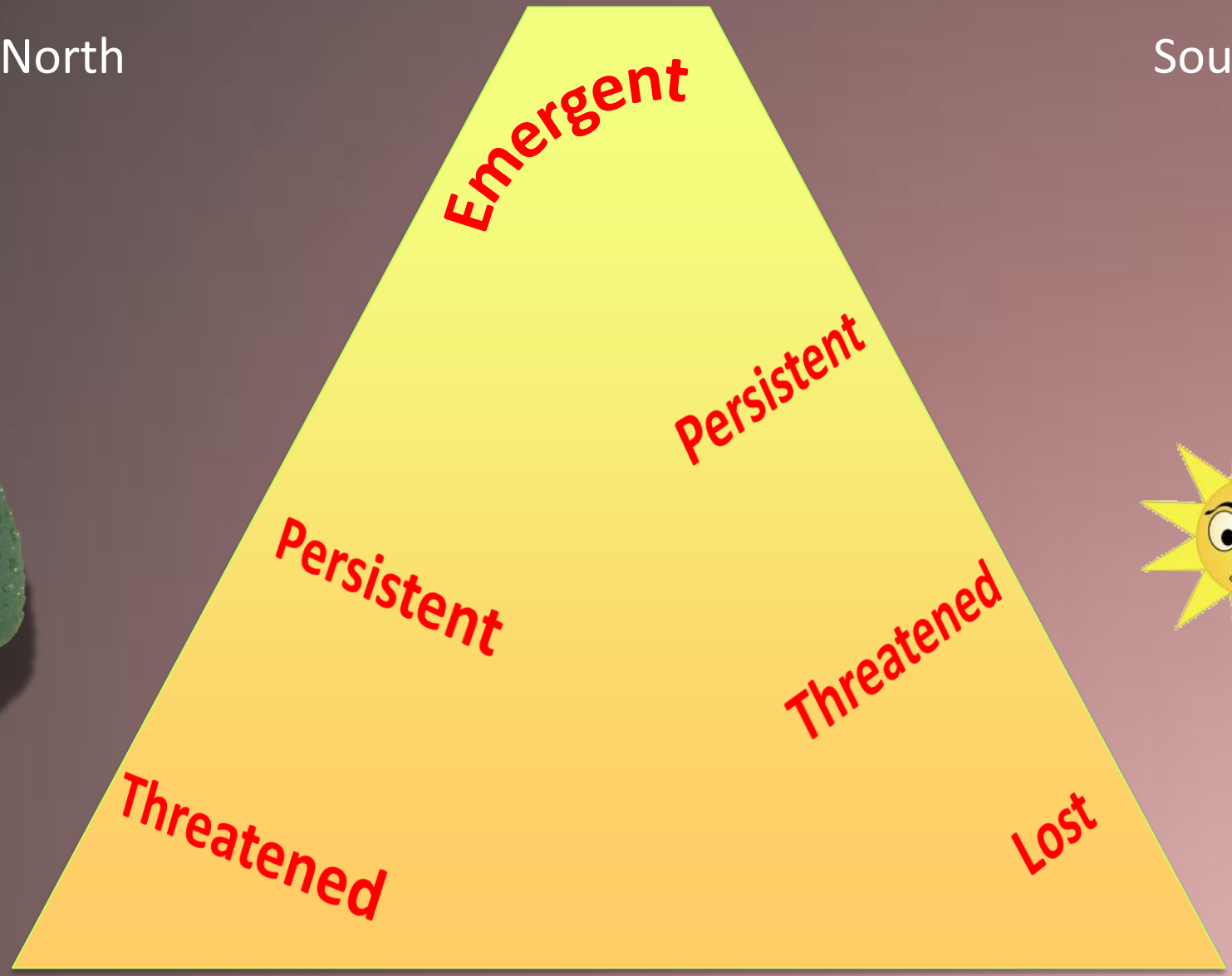
3. PERSISTENT – future climate will remain favorable. No climate-change adaptation needed, but normal management may proceed. Promote existing aspen near newly suitable areas.

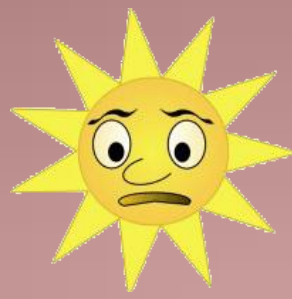
4. EMERGENT – areas outside current distribution that will become suitable. Allow/create disturbance to facilitate migration.

“Aspen Mountain”

North

South



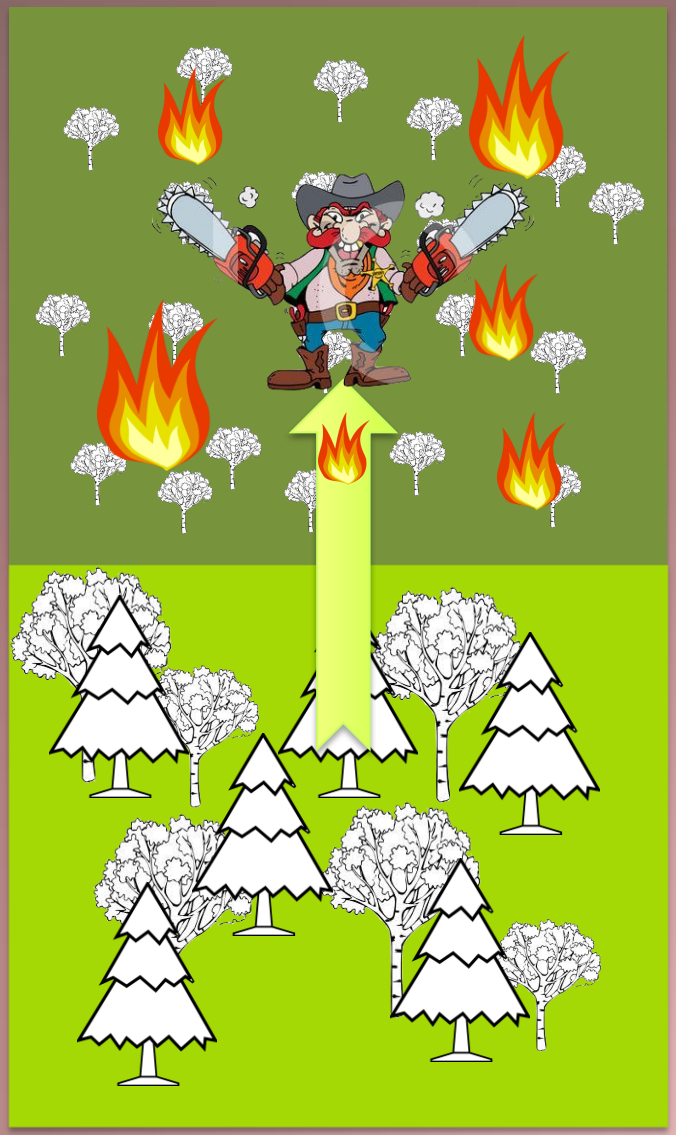


Adaptive Management

- During favorable climate periods, facilitate:
  - Resilience: regenerate patches of mature aspen in THREATENED habitat zone to increase younger component on landscape.
  - Recovery: Treat previously affected SAD stands to aid recovery and regeneration, but not in the LOST habitat zone.
  - Migration: Conduct treatments and/or allow natural disturbances to proceed in the PERSISTENT and EMERGENT habitat zones in order to facilitate self-migration of aspen.
- During extreme climate periods/SAD episodes
  - Prioritize treatment of new SAD patches
    - In the THREATENED zone only
    - Before dieback/mortality reaches 50%

Facilitating Migration

- Promote existing aspen near newly suitable areas to enhance seeding potential
- Favor disturbances (esp. fire) in newly suitable areas to facilitate aspen establishment
- Last resort: Plant seedlings in newly suitable area



The proposed strategy is:

1. Based on well-defined objectives: resilience, recovery, and migration.
2. A strategy for locating treatments to best achieve objectives.
3. Consistent with the silvicultural treatment matrix already prepared. No new tools or types of treatments.
4. Science-based. Most published studies, surveys and modeling were conducted on the GMUG or include the GMUG.
5. Incorporates climate-change adaptation into the EIS at a fundamental level.

The proposed strategy is:

6. Proactive:
   a. improves resilience of aspen before anticipated extreme weather,
   b. aids recovery of SAD-affected stands before they are too far gone,
   c. facilitates migration of aspen to newly suitable areas.
7. Adaptive:
   a. provides for climate-change adaptation of aspen forests,
   b. strategy adapts to climate extremes and occurrence of new episodes of SAD.

“. . . the future has already arrived.”

— *Andreas Hamann*